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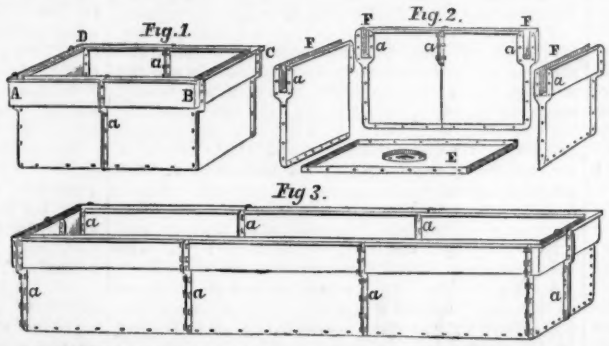
Munzinger's Improved Gas Purifier.

The gas purifier shown in the accompanying engraving the invention of Peter Munzinger, Esq., Gas Engineer, of Messrs. Morris, Tasker & Co., Pascal Iron Works, Philadelphia, is being successfully introduced and extensively used. It is formed in sections that its capacity can be indefinitely increased at will. It is durable, simple in all its parts, easily fitted up, and readily transported. The angle or corner pieces, A, B, C, D, (Fig. 1.) and the bottom piece E, (Fig. 2) are bolted together; the water cup, F, being cast with and forming the upper portions of the verticals or side and end sections. To enlarge the purifier in the directionof its length, the angle or corner sections, and the bottom are unbolted and spread sufficiently to admit the side sections, G. Figure 3, an additional bottom section, completes the longitudinal enlargement. To increase the width, end sections are inserted. Between the end legs of the angle or corner sections and corresponding sections are added to the bottom. The flanges, *a*, by which the sections are bolted together are outwardly projecting, for facility in fitting up, and also not to interfere with the depending edges of the lid or cap. In the enlargement of the purifying capacity of gas works, the introduction of Munzinger's improved purifier does away entirely with the employment of additional purifiers, or the replacing of those in use by others of increased capacity. Its application is also rendered especially easy by the adoption of outwardly projecting flanges for joining the respective sections. This invention effectually meets the wishes of all gas engineers, its results being entirely satisfactory.

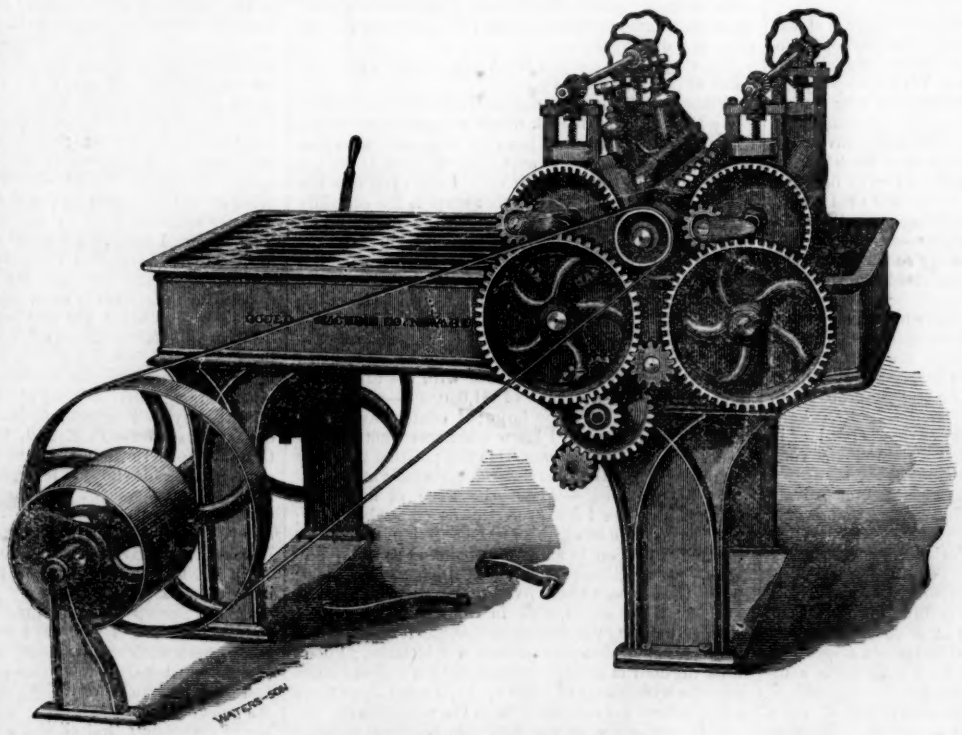


MUNZINGER'S IMPROVED GAS PURIFIER.

Small Planer and Matcher.

The value of machinery to take the place of hand labor is more apparent, perhaps, in the Planing Machine, than almost any other invention. The great amount of work, even the smallest sized machine can turn out in a given time, is really wonderful. Herewith we give a view of one of the most popular of these labor-saving machines. The mechanician will readily understand the arrangement of the rotary cutters and its general construction by referring to the engraving.

This is an iron frame machine, strong and substantial, adapted to all kinds of ordinary work, and combines all the improvements of the larger machines. The cylinder is wrought iron, made in such a manner as to form a double iron for planing hard and cross grained wood perfectly smooth. The cylinder bearings, unlike this sized machine of other makers, are on a solid iron frame, which slides above the work, same as in the large planers, and holds the cylinder steady, and does better work than when the slide is below. It will plane 24 inches wide, and up to four inches thick, and will plane and match 14 inches wide. It is not intended to be used as a constant matcher on heavy stuff, but for light work will do as much as the larger machine. The tight and loose pulleys are 12 inches in diameter, 6 inches face, and should make 825 revolutions per minute. For further information apply to Gould Machine Company's Works, Newark, N. J., or at their New York Warehouse, 102 Liberty Street, N. Y.



PLANER AND MATCHER.

Gas Generatiug Apparatus.—A curious machine has been invented for generating gas, [illegible] the *Scientific Press*, which is cheap, simple, and durable. It consists of a cylindrical vat or tub, which is filled with pumice stone. Over the latter is poured gasoline, which consists of a compound of the most volatile portions of petroleum oil. The inflammable material is then poured over the stone until the latter ceases to absorb the gasoline, when the surplus liquor is drawn off through the means of a faucet at the lower end of the vat. Above the vat is placed an air chember in which bellows, operated by machinery propelled by a spring like clockwork, are placed. The bellows force air through an india-rubber tube into the vat where it comes into contact with the generated gas and forces it through pipes to the burners. The light produced is steady and brilliant; and in point of economy, we are told that it far exceeds anything in use. As soon as the gasoline escapes or evaporates from the pumice stone, the latter is again saturated, and so on for any length of time. The safety of the apparatus for burning gasoline is a very strong recommendation in favor of its general adoption.

The Gas Investigation.

[*Continued from page* 307.]

H. P. McGowan, Secretary of the Harlem Gaslight Company, who was sworn and examined by Mr. Mitchell, chairman of the committee, testified mainly as follows:—I am a stockholder in the Harlem Gaslight Company; I am secretary of the company, and conversant with the business management; fifty dollars per share was the original price of the stock; it has recently been sold at 195 per cent; I receive a salary of $4,000 per annum; complaints often come from consumers; we give two notices before we cut off the gas; dividends are declared semi-annually; the largest dividend was declared in February, 1866; we issued an extra dividend of thirty-three and one-third per cent; the company was organized in 1855; the total amount of dividends declared is 156 per cent, an average of eleven per cent per annum.

Witness was examined by Mr. Bergen in relation to the photometrical tests made by the company, but no points of interest was elicited further than as given in the testimony of Mr. Balmore, engineer of the company.

By Mr. La Bau—We have about sixty and one-half miles of pipe; our original capital was $150,000, and it was increased from time to time until 1864, when it was made $1,000,000; the statement that we have never made any report is incorrect, as there was a resolution passed in March, 1866, by the Legislature ordering the company to make a report on all matters connected with the company; in reply to this resolution I made a report, which is now on file at the Assembly.

W. H. Davidson, being recalled, placed in evidence the transcript of his business; he had found that he was slightly in error; I said eight per cent was the greatest error I found; I find that there have been errors of nine per cent, and one as high as sixteen per cent; I read Mr. Roberts' statement, as published, but I cannot find any record in my office of it; it must be mislaid; I remember the case quite distinctly, but I have no official record of it.

William Lester, being sworn, testified:—Am deputy meter inspecter; have held the office two years; I was working at the meter business before I was appointed; I test every meter before sealing it; a new meter may receive in usage on the way; very little will put a meter out of order; I have never received any consideration, direct or indirect, from any gas company; we do not charge anything for inspecting new meters; when a complaint is made about a meter if the person sends it to the office we charge nothing, but if Mr. Davidson sends a gasfitter to take it down he charges for the gasfitter's time; I am a gasfitter; do not work for any establishment or gas company; my time is chiefly occupied at the inspection, I receive $800 a year for inspecting: I was engaged at the meter factory before I was appointed about one week; I am not a meter maker, but am acquainted with the business; I am not a citizen of the United States; a gentleman of this city secured me the appointment.

Examined by Mr. Bergen at some length as to the method of inspecting and testing meters. The testimony on this point was not of any general public interest.

Henry Chauncey, of 25 Washington square, a stockholder in the New York, Manhattan and Metropolitan companies, being sworn and examined by the chairman, said—I am a director in the New York Company: I have been away in Europe during the past four years, and my brother has acted as my agent and has collected the dividends: I do not know the amount of dividends declared: I would rather not state how much stock I own: I do not know whether I receive two or fifty per cent, but I think I have a good investment or I would not hold on to it: I can't tell anything specially without consulting my books: I do not know the number of extra shares I have received from the company: I have not attended any meeting at which dividends were declared.

By Mr. La Bau—I am sure I have not received any extra stock or profit from the Metropolitan Company: from the Manhattan I have received the certificates of indebtedness: I would not like to hazard any statement in regard to figures, as I would be obliged probably to come back and correct.

Witness—Am I obliged to answer these questions in regard to my pivate affairs? I don't think the committee has the right to ask——

Mr. La Bau—We do not wish to go into your private matters, but we ask you as a director of a public concern.

The Chairman—This New York Company is very unwilling to answer anything. The President won't answer anything without the authority of the directors and the directors refuse to answer anything.

It was finally decided to waive the question for the present, as the witness was evidently not acquainted with the affairs of the company in which he is a director.

Dr. Elmer being called and sworn testified—I am a physician, and have given a great deal of attention to this subject of artificial light: have found that nearly double the amount of gas may be made from the same quantity of coal, without increasing the expense, and give at the same time a better light, by utilizing the hydrogen wasted in the manufacture of gas: besides, the gas would be pure and would not be contaminated with sulphur compounds, like the other gas: my attention was called to the subject by the bad effects of the impure gas on patients: I have called the attention of the companies to the matter: they have sent committees to examine, but they have done nothing in relation to it: in Philadelphia the gas is supplied by the city, the same as the Croton water in New York: the illuminating power there is about fourteen candles: there is no doubt about the lime process being the best for purifying, but if the companies would use the lime and iron in conjunction it would do away with the offensive odor, and would not increase the expense: I have tested the gas furnished by the Manhattan Company, and have found it generally fourteen candles, but very often it is as low as twelve candles: a good, fair quality of gas should be eighteen candle power: my tests were made at a distance of about one hundred rods from the Manhattan gas works: I believe unquestionably that the gas companies could furnish a better gas at a more reasonable price than they now do.

Cornelius L. Everett, vice president and treasurer of the New York Gas Company, being sworn and examined by the chairman, testified—I am vice president and treasurer: I supervise the accounts, but am not the bookkeeper, and therefore not familiar with the business: I am a stockholder: the last sale of stock I believe was 280: I think the receipts of the company the past year was about $1,800,000: I do not know that I can give any testimony further than the president has given: the president has entire charge of the affairs of the company: the secretary keeps the books and the minutes, and the vice president and treasurer merely receives the money, puts it in the bank and attends to the customers' accounts: I think Mr. Newcombe's testimony about the dividends is about right: the dividends are declared by the directors; the bookkeepers make out all the bills.

The Chairman—I want to ask you, as stockholder, director, vice president and treasurer of the company, who is the proper custodian of the books? A. The president.

I know nothing about the price of coal or expenses, as that does not come within my province; my duties are sufficiently onerous without having other matters to look after.

By Mr. Bergen—The reason why our stock is worth $280 is, I suppose, because it was never watered: our charter was granted in March, 1823: we have never made any application to have our capital enlarged by law: we are acting under the charter of 1823: the continued operations of forty odd years and the increased value of our property, I believe, are the principal causes of the present value of our stock, which is very moderate; I could not tell the value of the property, as that is not in my department, and I have not made it a study: we declare dividends semi-annually, and whenever we are rich enough we give an extra dividend: about the frequency of the dividends, that is a matter of opinion: the stockholders may think they do not come often enough: gas dividends are quite different from other dividends, as we are liable to be superceded by some new discovery.

The Chairman—So you think you ought to make as much as possible while you can.

Witness—Self-preservation is the first law of nature.

By Mr. La Bau—I think if we stopped business today our real estate might possibly bring half a million dollars, perhaps more; I cannot say whether there is a million of dollars in assets or not: I can't tell how the president could make it out: that surplus has certainly been accumulated from the profits of the company: we had a great deal of property in different parts of the city, New street and other places, where we had gas holders to equalize the pressure in different places; of course we sold these when property increased in value; this real estate was purchased out of the capital; if the statement made by the president be true that we have $1,000,000 of personal property we are richer than I thought we were, in accordance with the capital authorized by law—a capital of $1,000,000—a dividend of $500,000 appears to be large; I could have ascertained these matters if I knew what was wanted.

Mr. La Bau—That arises from the position taken by the president on the first day—antagonistic at once.

By the Chairman—About the issue of any extra shares is a matter I must refer to the stock book for; we have no more stock than our capital permits; we had not a million in and we distributed the shares to make up the million; the capital paid in was $750,000; the extra issue was about five years ago; we had a reservoir in New street, two in Church street, two in Roosevelt street; the managers thought it did not fulfil the object for which the reservoir was intended; I don't think the district in the neighborhood has suffered much from the withdrawal of these tanks; I don't think there is much cause for complaint from the newspapers.

E. R. McCarthy, of the Hoffman, testified to good quality of gas furnished the house and fair bills.

Joseph Sampson, a stockholder in the Manhattan and New York companies, testified—Am a director in the New York Company; the dividends are declared regularly in May and November, five per cent each time; other dividends are declared when they have the means; there were four dividends in 1868; in May five per cent, another of twenty and another, I think, of twenty, but I am sure the dividends were fifty per cent in all; I should suppose the dividends would average that for some years—how many I do not know; the increase of the stock was made at the rate of one share to three; at the last sale of the stock I bought some at three hundred per cent; I do not know as it would generally be considered a very good investment; I have never been assessed for any improvements; there is a large surplus; my impression is that there is a surplus on the books of about as much as the capital; I think the last balance sheet shows two million dollars, which is one million dollars capital and the surplus; I have been a stockholder in the Manhattan Company some two or three years; I cannot state the highest dividends from that company; I receive the certificates of indebtedness and seven per cent on it.

Moses Taylor, being sworn and examined by the chairman, testified—I am interested only in the anthracite coal by being a director in the Delaware, Lackawanna and Western railroad, which is engaged in the anthracite coal business; the gas companies do not use that kind of coal, and therefore I know nothing of the prices they pay for coal.

By Mr. La Bau—I am a stockholder in the New York, Manhattan and Metropolitan Gas Companies; I think the last dividend from the Metropolitan was twelve and a half per cent; the capital of the company is $2,500,000; I am a director and know nothing of the business of the company.

Witness testified to the dividends of the New York Company last year, and to the certificates of indebtedness, which had already been fully explained.

Samuel Sloane being sworn and examined testified—Am a director of the Manhattan Gas Company; I think I received three dividends of five per cent each last year, but am not sure about that; I do not hold now any of the certificates of indebtedness; I had some but sold them; I do not know the aggregate amount of receipts or expenses or the number of consumers.

John B. Bouton, one of the editors of the *Journal of Commerce*, being sworn, testified that since Wednesday night last we have had no cause to complain of the quality or quantity of gas; before that we had serious cause to complain; sometimes the gas was so bad we were obliged to use candles; the quality of the gas is about the same in all parts of the house; the cause I believe is that the gas is poor: there was also complaint of the bad odor from the gas which, by the way, is not noticeble since Wednesday: I do not know anything about obstructions in the pipes, but I only know the fact that the pipes have not been changed or interfered with, and now, since Wednesday, we have all the light we want.

Valentine T. Hall, Secretary of the Brooklyn Gaslight Company, being sworn and examined by the chairman, testified—We are acting under a special charter, dated 1826: it has been amended several times: it contains no regulations as to the price of gas or quality we must furnish: we may charge anything we please: it is to our interest to furnish good gas: our dividends will average about seventeen per cent, we made a report to the Legislature last year: we are continually laying mains and making improvements: our capital stock is $2,000,000: it was originally $250,000: we gave extra stock to our stockholders when an opposition company was started: the par value of the stock is twenty-five dollars per share: the last sale was 240 per cent; the price of coal delivered on our dock is about $8.50, and we have some as high as sixteen dollars: am not a stockholder: I suppose we could not replace our capital for less than $4,000,000: our price is $3.25: we have been charging that for some six years; we require a deposit for the meters in accordance with the law of the State; we pay seven per cent interest on the deposits; we give two notices before cutting off the gas; we make tests of the quality of gas daily; it is about fifteen candles; it has run down as low as thirteen, and it is often much higher; our directors are H. D. Polhemus, S. L. Huested, Cyrus P. Smith, A. W. Benson, H. K. Sheldon, James Howe, C. E. Bill, William Hunter, Jr., P. C. Cornell; there was a company called the "Citizens'," started in Brooklyn some few years ago, but we never made any arrangement with them whatever; our district is from Atlantic street to Flatbush avenue to the city line and up through Williamsburg to the limit of Brooklyn; we have about 14,000 consumers.

By Mr. La Bau—We have no regular time for declaring dividends.

By Mr. Bergen—I am not practically acquainted with the manufacture of gas, but I understand the routine; I have been with the company about nineteen years; the photometrical examinations are made at the works; I presume the value of the gas deteriorates the further the gas goes from the works; we have the usual number of complaints that all gas companies have; when we receive a complaint we treat the complainant as

civilly as possible and explain all we can to him; we proceed according to law generally; those complaints are not warranted by any fault of the company; a burner continued in use for a long time will, of course, grow larger and burn more gas; Mr. Greaton's statement before the committee is incorrect; his bill commenced in summer and did not suddenly increase from $1.50 to $6; it took six months, and the increase was very gradual; furthermore, Mr. Greaton agreed to pay the bill that was due on the house at the time he took possession; that he did not pay for some time, and he left owing a bill which he has not paid.

By the Chairman—We have the State Inspector's seal on every meter; we have not found any of the meters incorrect; we charge the city of Brooklyn so much per 1,000; we put a four foot burner on each lamp and the city names the number of hours the lamps shall be lighted; we include the United States tax in the $3.25.

Wm. P. Libby, President of the Citizens' Gaslight Compano, being sworn and examined by Mr. Bergen, he testified as follows:—Our company was chartered in 1859; we commenced to furnish gas in 1861; we charged $2.50, and during the competetion the price went down to two dollars; taking in all items, including taxes, the cost of our gas was $2.27 per 1,000; we do not deduct the residuum from coal; we charge consumers $3.25; our tests at the works will average sixteen or seventeen candles; when we use the same quality of coal we do not make the test very often, but when we change the kind of coal we make the tests oftener; the amount of gas sold last year was 131,000,000 feet; the capital of our company is $1,200,000; in 1862 we commenced on a three per cent, semi-annually for two years; then two years four per cent semi-annually, and since five per cent; we declare the dividends regularly; we have the usual number of complaints and of the usual style; they are few in the relation of percentage; we have a scale at the pressure room and we run the pressure from two and a half inches to one inch, according to the hour and the amount of consumption; I am a stockholder in the company; the inspection and making out of the bills are in the usual manner: we make an average only when the meter ceases to register; when the meter appears to be running slowly we remove it and test it at our works; I think we find that ninety per cent of the meters will be found to register slowly or in favor of the burner; I am strengthened in this belief by knowing how much more greater quantity we run out than we get paid for.

By the Chairman—We are working under the general law; our original capital was $1,000,000; the par value of our stock was twenty dollars per share; we have never declared any extra dividedd; we include the expenses of repairing, &c., in the cost of gas, new buildings, &c, we pay for out of a construction fund in our capital; we have a surplus of $101,000; it would be impossible for me to tell the value of our property; we generally require a deposit from every consumer, except when we know the party to be responsible we waive it; we always give a notice of our intention to cut off the gas; W. H. Libby, W. A. Husted, W. H. Nichols, J. H. Curtis and S. S. Powell are directors; we charge the city of Brooklyn between forty-five and forty-six dollars per year for each lamp; we had about 250 more consumers in 1868 than in 1867; gas companies are always complained of and never complain.

Witness then went on to explain why gas companies are complained of the world over. He stated that he believed if the committee would summon every consumer in New York and Brooklyn they would hear the same complaint; it is because of the belief that the consumers are at the mercy of the companies: it is not the price or the quality of the gas or the treatment they receive, but the fact that the companies, the monopolies, are their masters, and they do not like that; gas making is a monopoly, and it must remain so; at Glasgow, where they have the very finest coal and furnish gas of thirty candle power at a price of about four shilling sterling per thousand, there are the same complaints, and in London I learned from one of the companies, which furnishes gas at less than one dollar in gold per thousand, that every year there are committees from Parliament to examine into the alleged extortions and that there is a good library of reports on the subject; witness gave a lengthy statement of the difference between banks, &c., and gas companies; I would be satisfied to have our gas inspected by a good, scientific man and furnish fourteen candle power to a five foot burner.

Charles F. Catlin, Jr., secretary of the Citizens' Gaslight Company, being sworn, was examined by Mr. La Bau, and testified as follows:—Have been acting as secretary since 1866; have 5,235 consumers; we charge three dollars and twenty-five cents; I think our stock sells at 156 per cent; our district is all that part of the city south of Atlantic and Flatbush avenues.

No new points of interest were elicited from this witness.

Charles F. Blodgett, secretary of the Williamsburg Gaslight Company and of the Greenpoint company, now merged in the Williamsburg, sworn and examined by the chairman:—Our company organized in 1860 with $80,000 capital; our capital has been increased by law; the par value is $50 per share; I am not a stockholder; the last sale was $150; the illuminating power is from fourteen to sixteen candles; I can hardly tell the value of the property; we bought the property for $40,000 and I think it would now sell for $150,000; since 1860 our dividend would average ten per cent, before that we paid nothing; to the credit of profit and loss we have a surplus of $70,000; we charge four dollars per thousand, subject to discount; we have some 3,000 or a few more consumers and a smaller number of street lamps; we do not require a deposit from any person we know to be reliable: we never cut the gas off without notice; we reimburse the cost of improvements by calling in installments of stock: last year the coal was delivered to us at the dock for eight dollars: we paid for cannel coal about fifteen dollars.

By Mr. La Bau—Our receipts for 1868 were: $252,000 from private consumers, $2 200 from public buildings, and $61,500 for street lamps: the receipts from coke, tar, wharfage, &c., $38,450—making a total of $352,300. Our company has always made the reports required by law.

New and Invaluable Invention.

THE COMBINED ANTI-FREEZING AND DRIP-RECEIVING LAMP POST.

This invention relates to constructing the post with all the openings in the base closed, and the post made perfectly gas tight, the upper end being fitted with a cast iron stopper, which is drilled to receive a short piece of half inch pipe, to which the burner cock is attached. The base of the post is drilled and tapped five inches above the extreme lower end of post, to receive the service pipe, which is made in two pieces, and connected with a running thimble or other union, and the gas let in at the base, no upright pipe being used inside the post. By this arrangement all the dust and impurities, and all the moisture condenses and settles to the bottom, and secures the following very important advantages—to wit: It can never freeze up in any climate during the most severe and protracted winters. It can never choke up with dirt or water in the pipes; and on account of the greater purity of the gas, it gives more light with the same burner. As a matter of economy we have the saving of ten or more feet of pipe in every post, and its subsequent renewing. It is far more durable, because oxidatien can only take place on the outside. It requires less attention, because all impurities go to the bottom, and not to the burner, which will aequire cleaning only once a year, the flame keeping its shape and giving a clear and brilliant light. This post cost no more than any other, and is more easily fitted up. This improvement can be applied to all old posts now in use, with very small expense, and made as good as new, with either inside or outsido fittings. This post has been thoroughly tested during the past winter, and it has given the most perfect satisfaction in every partieular. For other information, or rights to make and use it, address JOHN W. GRAHAM, Inventor and Patentee, Chillicothe, Ohio.

The Smallest Steam Engine in the World.

A writer in a London periodical thus describes a minute model of the engines of the steamship Warrior made by Thomas Smith: "This tiniest working model in the world is now in the possession of John Penn (of Greenwich), the eminent maker of the great engines of which it is the infinitely reduced counterpart. It will stand on a threepenny-piece; it really covers less space, for its base-plate measures only 3-8th of an inch by about 3-10th. The engines are of the trunk form introduced by Penn; the cylinders measure 1-8th of an inch diameter, and the trunk 1-20th. The length of stroke is 6-40th of an inch. They are fitted with reversing gear, and are generally similar in design to the great machines with which ships of the Warrior class are equipped. From the extreme smallness of this model a few minutæ—such for instance, as the air pumps—have necessarily been omitted; there is a limit beyond which human skill and minuteness cannot pass. Still, s osmall are some of the parts that they require a powerful magnifying glass to see their form. The screws which hold the members together are only 1-80th of an inch diameter, and these are all duly furnished with hexagonal nuts, which can be loosened and tightened by a Liliputian spanner. The whole weight of the model is less than a threepenny-piece. It works admirably, and when working its crank-shaft performs from twenty to thirty thousand revolutions in a minute."

Electric Illumination.

SUNDRY EXPERIMENTS RELATIVE TO THE PRODUCTION OF ELECTRIC LIGHT, BY F. P. LE ROUX.

(Concluded from page 197 of the American Gas Light Journal.)

A short time ago we published the first portion of this article; since then we had to defer the ramainder, owing to the press of other important matters ir our columns.

On a Mode of Dividing Electric Light.—The fact here admitted as the result of experience that, in order to produce electric light most advantageously it is necessary to employ a considerahle number of elements arranged in series, may be of some theoretic consideration; operators usually fifty elements of Bunsen. Liaht may be produced by a much smaller number—twenty, for instance—but the quantity of light produced is proportionately less, and the working condition arising from length of arc, regular consumption of charcoal, and exhaustion of pile, is much less favorable than when a larger number of elements are used.

On the other hand it is an advantage in many cases to be able to distribute the entirety of light yielded by a pile or electro-magnetic machine into several distinct lamps.

The only means which have been hitherto tried to my knowledge are, after dividing the source, the introduction of several arrangements into the same circuit, and the bifurcation of a single current into several lamps.

Thus, as to the division of light into two burners, and supposing the source to be a pile of fifty elements either of the three following dispositions may be made:

1st method. Dividing the source.—Compose two piles of twenty-five elements each, and conduct each to a special electric burner.

2nd. By succession of burners.—Dispose the fifty elements in tension, and conduct the same current through the two arrangements successively.

3rd. Bifurcation.—Retain the fifty elements in tension and direct the current into two arrangements. We have already stated that the first system of two small piles was less advantageous with regard to the entirety of light than the ordinary system of one.

The second system has no advantage over the first, but possesses the disadvantage that if by any means the condition of one of the burners be altered, the other will sympathise; therefore, as from the very nature of all regulating apparatus hitherto known, the movement of the charcoal depends on the intensity of the current; movements induced by the state of the electrode in one regulator, will indubitably occur in the other if they be really equal. If one were more sensitive than the other it would be always separate, and consequently there would sometimes be a contact of the electrodes, and sometimes a rupture of the arc from too great elongation.

The third system of bifurcation or derivation has not the same drawbacks; the two arrangements do not influence each other in the same inconvenient way, but fall under the same conditions as to intensity as in the method of equal divisiou of the source.

I have meditated dividing the current into periods, in order to separate the light into spaces, profiting by the power possessed by the arc of spontaneous re-establishment after an interruption of short duration.

Let us suppose that by means of appropriate mecanism the current is made to pass into one arrangement during 1-100th of u second, then during the next 1-100th into another arrangement, and again back to the first during the next 1-100th, and so on. As the duration of the interruption is short, the arc re-establishes itself spontaneously; and as it is also weaker than the permanency of the impression received by the retina, the arc itself being but a feeble source of light, the eye will consequently receive a sensation of continuity; moreover the incandescence of the electrodes varies only slightly. It is not to be denied that this experiment presents more theoretical than practical interest on account of the complication involved by the mechanism necessary to divert the current into sundry arrangements, nevertheless in some cases it may be found useful.

If the apparatus works regularly the sparks will be feeble, but they will be altogether fatal if one of the burners should act alone, and this vexatious occurrence should be above all avoided, which may be easily done by arranging in such a way that if by any means one of the burners should be extiuguished, the current should still find an outlet on that side.

To render the sparks as harmless as possible, it is a good plan to multiply the contacts, it being apparent that if instead of one spring we substitute one or more, there will be some chance that at least one may be always in perfect contact with the wheel. This, however, will not be the case if a cause of displacement, common to all, should arise, which is exactly what happens at every change in the teeth; for this reason only a small distance, not more than a millimetre, should be left between any two consecutive teeth, and the con-

tacts should be arranged so as not to leave one tooth until they have slightly touched upon the next.

The surface of the contacts being more easily repaired than that of the wheel, it is preferable to cause communication between the former and the positive pole.

The vibrations of the contacts may be lessened with some success by mounting them upon springs composed of several thin plates, alternated with layers of guttapercha.

Combination of the Incandescence of Earthy Oxides with that of the Charcoal Points between which the Voltaic Arc is produced.—In applying electric light the method generally proposed is to direct it into a more or less limited region of space; all which escapes into the opposite region would be lost if it were not collected by reflectors more or less appropriate to the purpose. On the other hand, experience has proved that the voltaic arc is prone to irregular displacements, consequent upon inequalities in the cohesion of the charcoal, impurities contained in it, and above all the slightest agitation of the air. The most luminous portions of the charcoal electrodes being, as we have already remarked, the surfaces between which the arc arises, these surfaces are inclined sometimes in one direction and sometimes in another by reason of the displacement which the ore undergoes, the result being a considerable variation in the effect of light produced by the latter in any determinate region.

I believe that if there could be placed on the opposite side to that towards which the light was to be directed, and in proximity to the arc, some body capable of reflecting back in a luminous form the enormous number of radiations thrown upon it by the electrodes and the arc itself, these radiations would be more profitably utilized than by any other method, the arc being at the same time protected by a sort of screen, annulling in an almost hemispheric region all the abovementioned disturbing causes.

The substance chosen for such a purpose should be at the same time a bad conductor of heat, and possessed of great powers of radiation, conditions fulfilled to a great extent by lime, magnesia, and earthy oxides in general. I first effected the experiment with cylinders of magnesia compressed according to the process of M. Caron, and manufactured for purposes of oxyhydric illumination. By placing the base of one of these cylinders, whose diameter is about eight millimetres, at a short distance from the charcoal points of an electric lamp, in such a way that the magnesia may be, as it were, licked up by the voltaic arc, it will assume an incandescence equal to that of the most luminous portions of the charcoal. At the same time the light acquires remarkable constancy from the fixity of the arc, which may be drawn to greater length than in ordinary cases, because as the magnesia forms a screen and maintains the elevation of the temperature, the chances of the arc being broken are greatly diminished.

The magnesia may thus be kept in contact with the voltaic arc for more than an hour without sufficient consumption to cause any apparent change in the conditions of the experiment; its surface becomes hollow during the first few moments, but if the bar of this substance is kept fixed, the power of the arc abating at a very slight distance, it will no longer be consumed. Another kind of alteration will, however, ensue, the magnesia will imbibe the siliceous vapors emitted by the voltaic arc, and combine with them in a sort of glass, which, when cold, is of a pale greenish hue, and extremely hard. This fact is disadvantageous, inasmuch as it greatly diminishes the irradiating power of the magnesia, and renders the production of a commercial pure carbon in an appropriate condition for the purpose of electric illumination still more desirable.

The arrangement of a brilliant voltaic arc between two pencils of charcoal, and in the presence of magnesia or any other earthy oxide, would constitute one of the most beautiful sources of light possible to realize. It is probable that zirconia, whose remarkable properties with respect to the oxyhydric flame have been made known by M. Caron, would be equally beneficial in the case of electric light; but at present I have had no opportunity of trying it. It may nevertheless be inferred that zircona would, like magnesia, be quickly vitrified by the siliceous vapors of the charcoal, so that considering the high price of zirconia, it would be expensive to use unless the carbon were free from silica.

Decomposing Action of the Voltaic Arc on Earthy and Alkaline-Earthy Oxides.—When that splendid experiment which has since become familiar to us, though on a smaller scale, was performed by Davy with the pile of the London Royal Institution, he proved that the most refractory substances, such as magnesia, lime, and other oxides of the same kind, melted or even disappeared in this focus of intense heat.

Neither Davy nor any later experimentalists appear to have ascertained the nature of the alteration caused in the oxides by the action of the voltaic arc; the pursuit of other investigations has led me to a more attentive consideration of these phenomena, by which I have discovered that the oxides undergo a real decomposition. The advantages derived from the juxtaposition of a cylinder of magnesia to the charcoal points, for providing electric light, have been already alluded to; it may be added that lime or strontia will do equally well. If the cylinder of either of these substances be fixed, a slight cavity instantly forms at its base, and the conditions remain the same for an indefinite time, the arc continuing to play upon the body without inducing any modification but the vitrification caused by the siliceous vapors emitted by the impure charcoal. If however, the cylinder of earthy matter be brought into actual contact with the charcoal points, and the pressure maintained by a slight spring, the aspect of things is changed.

If a pencil of lime or even plain chalk be used, the carbons will hollow out in it a sort of trench in which the heat is condensed as in a sort of reverberatory furnace, and the amount of light emitted is proportionally augmented. On examining the light with a piece of black glass it presents the appearance of an opaque luminous cloud in which the extreme ends of the charcoal are undistinguishable, their usually well marked brilliancy being lost in the mass of light, and there is a sensible evolution of whitish fumes. The spectroscope displays an intermittent spectrum filled with large and brilliant rays which are recognizable as those described by different authors as characteristic of calcium, but their number and intensity is greater and they are better defined. This is not surprising if the difference between the luminous intensity attainable by this process and by those hitherto employed be considered.* It would be doubtless possible by this method to obtain much new information respecting the spectra of metals, provided that only pure products were employed.

The employment of strontia gives analogous effects under the same conditions, the light assumes a characteristic red tinge, and the spectroscope displays the rays characteristic of strontium, thus presenting a simple means of enriching the electric light with red rays. It may be here remarked that the flame always contains a large proportion of white light, for if the metal be set free in some parts of the flame, in others it returns to the state of oxide, the incandescence of which always yields a white light.

After this it can no longer be doubted that earthy and alkaline-earthy oxides undergo decomposition by the voltaic arc; it now remains to be ascertained by virtue of what action it takes place. Is it an electrochemical deposition? Does the oxide become a conductor by the elevation of temperature? Is it a reducing action of carbon vapor?† or lastly, is it, according to the theory of M. H. Sainte-Claire Deville, a result of elevation of temperature producing a separation of the elements in the same way as when oxide of mercury is heated? Do these three causes operate simultaneously? which is quite possible, or may one be wanting? I cannot say; but it appears to me that two may be suppressed; it is known to be possible to produce with solar light, concentrated in a focus of mirrors or lenses, a heat quite as powerful as that of the voltaic arc, and spectral analysis may be easily applied to these phenomena; to realize this idea, special conditions would be required not easy to improvise, but, nevertheless, I hope when possible to put it into effect.

Nothing can be easier than the practical application of the modes of improving the quality of electric light Arrange in the horizontal plane which passes between the charcoal points a tube formed like a cylinder, from eight to ten millimetres in diameter, containing the oxide to be employed; this is kept in constant contact with the charcoal by a weak spiral spring. Experience shows that the slight friction which ensues does not prevent the action of the apparatus which regulates the movement of the charcoal. It is possible, if the oxide employed be excessively impure, that the vitrified matter would cause the charcoals to adhere to it; this might, however, be easily avoided by causing the charcoal electrodes to rotate slowly upon their axes.

* The spark from the batteries doubtless possesses a higher temperature than that of the voltaic arc, but its duration is very short and its impression upon the organ of sight is an example of the brevity of its duration.

† Observations made by MM. H. Sainte Claire Deville and Debray in the course of their examinations of the metals of the platinum series, show that on the contact of gas-coke and lime, heated in a flame of oxygen and hydrogen gas, phenomena of reduction occurred; thus, lime which has been subjected to these conditions, when plunged into water, disengages hydrogen gas, and will even burn in the liquid.

A New Lighthouse Lamp.—One of our English exchanges contains the following notice of a novel lighthouse lamp, designed for burning liquid hydrocarbon oils, and claimed to produce a more powerful light than any other now in use: "The burner contains only about one pint of oil (without air space) and is supplied from a reservoir placed outside the lenses of a light-house, through a siphon, in such a manner that a constant light and quantity of fluid is always maintained in the burner, and air is guided to the flame by adjustable flanged rings, so that the most complete combustion of the carbon ensues, and the application of the lamp to, and its trial within, any first-class lighthouse, can be made without any alteration in the structure or in its arrangement."

The New York Society of Practical Engineering.

[*Reported Expressly for this Journal.*]

The regular fortnightly meeting of this society took place on Tuesday evening, April 13th, at Room 24 Cooper Institute. President James A. Whitney, in the aihcr; W. B. Harrison, Recording Secretary.

Steam Traction and Steam Carriages being the subject for the evening, the attention of the society was called to a paper read by Mr. J. K. Fisher on the subject. The paper first reviewed the endorsements and approval given by eminent engineers, relative to steam carriages. Many of these had not only approved of steam carriages but had experimented with them, and some had even built the particular kind of carriage, varying according to their notion of the ends to be attained by such a vehicle. Mr. Fisher also alluded to the investigations of the British House of Commons into the subject. These investigations were made under the direction of a committee appointed to inquire into the subject. The report of this committee, founded on a large number of facts, had a direct bearing on the utility and economy of the steam carriage. In discussing the reasons why this carriage had not been introduced into general use, the writer asserted that the excessive toll charged for such vehicles had been the principal obstacle in the way of its advancement. Attempts have been made to obtain an alteration in the law imposing this restriction, but without success. With reference to the mechanical difficulties in the way of the perfection of the steam carriage, the speaker remarked that the rocking of the engine from side to side was one of the principal causes of its wearing out. This is due to the oblique action of the connecting rod. This rocking destroys springs of any other kind than stiff and nearly immovable ones. Various experiments have been made to overcome this difficulty, and various devices invented for the same purpose.

Passing to the improvements that have been made on the steam carriage, the link valve gear was referred to, which was first applied to steam carriages about the year 1842. This controls the movements of the carriage with great ease, reversing the engine, or accelerating or diminishing its rapidity, as may be required. The manner of arranging the axles and the steering apparatus were also referred to.

After an interesting and animated discussion the society adjourned.

An Important Discovery.

Many attempts have been made to increase the durability of wood by the injection of certain solutions, especially that of sulphate of copper. On this subject, the French Academy of Sciences has received an interesting paper by M. Maurice Boucherie. He states that when properly effected, the injection of the abovementioned solution is always beneficial; and that the best way to perform it is by displacing the sap and then letting the wood dry in the air. To prove this assertion, M. Boucherie sent in with his paper a few samples of railway sleepers laid down in 1847, after being prepared in the way mentioned. They had been taken up but a short time ago, and were in excellent preservation. They were found to be harder to saw than any common dry wood. Their resistance was equal to that of green wood, and their elasticity had been preserved unimpaired. Our author contends, however, that it is not the excess of sulphate of copper to which they owe their excellence, but to the combination of oxide of copper with the cellulose of the wood. To show the truth of this, he remarks that, if the latter material, or linen or cotton cloth, be impregnated with cupric solutions, and afterwards washed in much water, until none of the metal salt be left, it will nevertheless be found that such substances will remain uninjured, however long they may lie buried in the earth; and that if they be afterwards treated with ammonia, oxide of copper will be obtained from them. It is well known that the continual contact of the iron chair with sleepers is injurious to the wood, and yet in the present case it has not been so, the wood having been used when perfectly dry after being saturated with the copper solution. The latter is rarely absorbed if the wood contain more than six per cent. of sulphate of iron. The nature of the soil in which the sleepers are laid exercises a great influence on their preservation. Thus, wood injected with sulphate of copper will not last long in calcareous soil or in tunnels. Cupric salts are now extensively used for telegraphic wire-posts.—*Morgans Brit. Trade Journal.*

Correspondence.

[Correspondents in all cases should sign their communications with their names and address in full, not necessarily for publication, but as a guarantee of good faith.—Eds.]

Table of the Principal Properties of the Products of the Distillation of Petroleum.

Mr. Editor: I send you herewith for publication, a table containing the principal properties of the products of petroleum. It is a compilation of several tables published by me from time to time in divers periodicals The first three columns contain the common and chemical names and formula; the fourth and fifth, the corresponding gravity; the sixth, the temperature at which each of these liquids boil; the seventh, which is the most important, the temperature at which the vapor of the liquid will ignite when a flame is presented; and finally, the eighth and last column shows the temperature to which common crude petroleum has to be heated, in order to drive off the corresponding liquid. In regard to this point, it should be remarked that it takes a higher heat to separate a more volatile from a less volatile product, than to boil the more volatile product, when once separated. This is perfectly analogous to the distillation of spirits; it takes much more heat to separate the alcohol from the mash, than to boil the alcohol afterward, when once isolated.

Among crude petroleums, those of the same specific gravity as kerosene (50° B.) and higher or lighter, will ignite at the same temperatures as benzine or gasolene, since they contain these substances; on the contrary, the so-called heavy crude lubricating oils, of which the specific gravity is 35° to 30°, and lower or heavier, containing no benzine, are comparatively safe, and will not ignite but at some 150° or 200°, according to their nature. Coal oils, and principally scale oils, are much more inflammable in proportion to their specific gravity than the products of petroleum. Scale or schist oil of 45° B., specific gravity, ignites already at 90° F., whereas kerosene from petroleum ignites only at 140°; scale of oil of 30° B., specific gravity, ignites at 130°, while kerosene from petroleum of the same gravity ignites only at 230° F.

P. H. Van der Weyde, M. D.

Products of the Distillation of Petroleum.			Specific Gravity.				
Common Name	Formula.	Chemical Name.	Water=1.	Baume Hygrom.	Temp. of Boiling P'nt.	Temperature of Ignition by Flame.	Temp. of Crude Oil from which it distilled over.
Hydrogen gas	$C_0 H_1 H$	Hydrium.					
Marsh gas	$C_2 H_3 H$	Hyd. of methyl.					
Petroleum gas	$C_4 H_5 H$	" ethyl.	0.605	98 deg.		Ignite at any tempera ture.	30 deg.
Chymogene	$C_6 H_7 H$	" propyle.	0 620	94 deg.	30 deg. F.		70 deg.
Rhigolene	$C_8 H_9 H$	" butyle.	0.640	88 deg.	60 deg.	— 20 deg.	120 deg.
Gasolene	$C_{10} H_{11} H$	" amyle.	0.670	80 deg.	86 deg.	— 6 deg.	170 deg.
Naphtha	$C_{12} H_{13} H$	" caprotyle.	0.705	70 deg.	150 deg.	— 2 deg.	200 deg.
Benzine	$C_{14} H_{15} H$	" heptyle.	0.745	60 deg.	195 deg.	70 deg.	300 deg.
Kerosene	$C_{16} H_{17} H$	" octyle.	0.785	50 deg.	240 deg.	110 deg.	400 deg.
"	$C_{18} H_{19} H$	" nonyle.	0.830	40 deg.	264 deg.	160 deg.	500 deg.
Heavy kerosene	$C_{20} H_{21} H$	" decatyle.	0.854	35 deg.	820 deg.	200 deg.	500 deg.
Lubricating oil	$C_{22} H_{23} H$	" endecatyle	0.880	30 deg.	356 deg.	230 deg.	600 deg.
" "	$C_{24} H_{25} H$	" dodecatyle	0.885	29 deg.	380 deg.	200 deg.	620 deg.
" "	$C_{26} H_{27} H$	" coinyle.	0.888	28 5 deg.	420 deg.	140 deg.	640 deg.
" "	$C_{28} H_{29} H$	" miristyle.	0.800	28.5 deg.	460 deg.	120 deg.	660 deg.
" "	$C_{30} H_{31} H$	" benyle.	0.803	28 deg.	490 deg.	212 deg.	680 deg.
Paraffin oil	$C_{32} H_{33} H$	" cetyle.	0.897	27 deg.	520 deg.	320 deg.	690 deg.
" "	$C_{34} H_{35} H$	" margaryle	0.900	26 deg.	550 deg.	350 deg.	700 deg.
" "	$C_{36} H_{37} H$	" stearyle.	0.900	25 deg.	560 deg.	370 deg.	710 deg.
" "	$C_{38} H_{39} H$	" balenyle.		25 deg.		400 deg.	720 deg.
Solid paraffin	$C_{40} H_{41} H$		0.880			430 deg.	740 deg.
" "	$C_{54} H_{55} H$	" ceryle.					700 deg.
" "	$C_{60} H_{61} H$	" melissyle.					
" "	$C_\infty H_\infty$, or	Heavy carburetted hydrogen.					780 deg.
Olefiant gas	$C_4 H_4$				—150 deg.		850 deg.

About Oil Meal.

Burlington, Iowa, April 12, 1869.

Messrs. Editors: Has your Penn Yann correspondent joined Samuel Hoyt, in keeping alive the huge joke perpetuated by the last named gentleman some years ago on a large number of the gas fraternity, or has he drawn so largely on his imagination as to suppose that a *pint* of "oil meal" to a bushel of lime is really a valuable article to use to take away that strong smell we sometimes get from impure gas?"

The aforesaid Samuel no doubt smiled audibly when he read the article of your correspondent in the last number of your Journal. Yours, Victim.

The Problem Sttll Remains Unsolved.

Tiffin, Ohio, April 25, 1869.

Messrs. Editors: I enjoyed a hearty laugh at the manner in which friend Slade answered my problem. Mine must be a wonderful centre seal to serve me such tricks, for the castings lay here yet, unused, as I work with another arrangement. I have no doubt he meant well, and I take the will for the deed; but I would direct his and your attention to the fact that my inquiry was *as to the nature* of the impurity that troubled me, and I stated that the ordinary tests *failed* to discover any; and that oftener changing the purifiers relieved me of the difficulty, but leaves me to "poke my nose into this business," for the want of a better test, and in ignorance of its nature, to which I had hoped the *peculiar* discoloration of the lime would have furnished the clue, and elicited the solution from some more careful reader, though not better meaning member of the craft than Brother Slade. Can none answer?

Yours truly, Machinist.

Bursting of Water Tanks.

Tiffin, Ohio, April 20, 1869.

Messrs. Editors: The following method of saving tanks and other open vessels from bursting by the freezing of liquids may be more generally known than I suppose, but will bear repeating, and prove acceptable to some who may be ignorant of it.

It is simply to put a piece of wood of any kind endwise in the liquor, with one end remaining above the surface. Its operation is not clear to me, unless it acts as a tube to carry off the gas said to be generated at the moment of congelation. I have fully tested it. A vessel that bursted a year ago with a small quantity of ice, made 13 or 14 inches this winter, without injury, by the insertion of a stick of cord wood, say four inch in diameter. Yours truly, Machinist.

Obstruction in Stand Pipe.

Knoxville, Tenn., April 26, 1869.

Messrs. Editors: With reference to Mr. Woodruff's letter in your last issue, I am one of your readers who have encountered similar obstacles, and I believe the cause of the obstruction is that the stand pipe is too hot, and the best remedy—the one I have found to succeed—is to keep it cool. When the stand pipe gets too hot, the heavy carbons instead of falling in the form of tar, consume in the pipe, and immediately forms a crust, which soon stops up the passage; and I would suggest to Mr. Woodruff not to charge the retort immediately after burning out the pipe, as the result will be what I have stated. I wish he had given the diameter of the pipe; they ought never to be less than five inches.

Respectfully,

James Somerville, Sup't Gas Co.

Chemical Reactions Produced by Light.

Professor Tyndall recently read before the Royal Society, a remarkable paper, detailing some of his experiments with the vapors of volatile liquids. A glass tube was exhausted of air, and a given vapor then allowed to enter it together with air which had been purified. An electric lamp placed at one end of the tube, sent a beam of intense light lengthwise through this mixture of air and vapor. The effect upon the different vapors experimented upon, was various and remarkable. In some cases, the beautiful clouds which were formed, exhibited the appearance of leaves and flowers. Each vapor had its own specific cloud. "With vapor of nitrite of amyl, a shower of liquid spherules was precipitated on the beam. With a modification of the beam, the precipitation was so rapid and intense that the cone formed by the beam, before invisible, flashed suddenly forth like a luminous spear. With iodide of allyl, the vapor column revolved round the axis of the decomposing beam, drawn in at certain places like an hour glass, while delicate cloud-filaments twisted themselves in spirals round the bells of the apparent hourglass. With iodide of isopropyl the vapor formed globes and cylinders, which were animated by a common motion of rotation, distributed at times by a paroxysm, in which beautiful and grotesque cloud-forms were developed, some representing a serpent's head, others buds which seemed to grow into flowers, and all of a gorgeous mauve color. With hydrobromic acid the cloud resolved itself into a series of disks and funnels, then parasols and rings of a very pale blue color, and all rotating as in the former instance.

"With hydrochloric acid the cloud requires twenty minutes for its full development, but then it appears in sections, each possessing an exceedingly complex and ornate structure, exhibiting ribs, spears, tunnels, leaves, involved scrolls, and irridescent fleur-de-lis. With hydriodic acid another modification is seen, having a family likeness to the two immediately preceding, but with marked differences of development, for the green and crimson produced were the most vivid that Dr. Tyndall has yet observed. The development of the cloud, as he describes, was like that of an organism, from a more or less formless mass at the commencement, to a structure of marvelous complexity, at which he 'looked in wonder for nearly two hours.'"

The different vapors are in these experiments differently decomposed. "Certain specific waves of the electric beam shake the molecules assunder."

Professor Tyndall anticipates "wide, if not entire, generality, for the fact that a liquid and its vapor absorb the same rays."

In this connection, we give this item: At a recent meeting of the Photographic Section of the American Institute, Professor Joy read the following extract from a private letter which he had received from Professor John Tyndall:

"My daylight hours have been recently occupied with the question of the chemical action of light upon vapors, and also with the blue color and polarization of the sky. These questions, which have been so long the great enigmas of meteorology, have, I hope, at length been brought within the grasp of experimont, and have been, to a great extent, satisfactorily solved. The condensed summary of my results is at the present moment in the hands of Sir John Herschell, who has manifesied great interest in the inquiry. As soon as he sends it back to me I shall hasten its publication, and it will give me great pleasure to send you a copy of it."

Scientific Discovery.—The Master of the English Mint, Mr. Graham, has discovered that the metals palladium, platinum and iron have the property of absorbing a hundred, and even sometimes a thousand times their weight of gas. It appears that the gas is not merely held in the cells of the metal, but incorporated therewith, for a piece of palladium gave off no gas whatever, though enclosed for two months in an exhausted chamber. Mr. Graham lighted on his discovery while analyzing a piece of meteorite.

Liquid Fuel.

It is now upwards of four years since one of the chief advocates of liquid fuel, in stating his opinion that forty-two gallons of oil was quite equal in steam-producing power to one ton of coals, admitted that this required to be proved. [See *Mining Journal*, Dec. 24, 1864.] Since that time experiments have been carried on at Woolwich Dockyard and elsewhere; numerous inventors of methods by which liquid fuels was to be burnt, have come forward to recommend their several inven tions; great attention has been devoted to this subject; and another material for the purpose been introduced to notice—the dead oil, or creasote, obtained in the manufacture of naphtha and pitch from the coal tar of gas works. This material is certainly more suitable for fuel than any other yet known, since its character is such as to render it free from any objection on the score of risk, which may fairly be urged against the use of petroleum or paraffin oil. Amid all this activity on the subject of liquid fuel we have not, however, yet met with the promised demonstration that one ton of oil is equal to six ton of coal, although this point is one of the greatest importance for deciding the question as to the applicability of liquid fuel in the place of coal for steam navigation. But, meanwhile, a number of discrepant estimates as to the capacity of liquid fuel have been put forward, and a still greater number of estimates have been made as to the results obtained with it, these being still more discordant than the estimates. The system of converting the oil into the condition of spray before burning it was a great step towards effecting combustion more freely and completely than was at first possible. This system, however, involved the disadvantage of requiring an expenditure of steam which was equivalent to a reduction of the heating power and efficacy of the fuel; and, besides this, the use of a steam-jet for the purpose, though very simple, is at the same time very wasteful, and, as pointed out by Mr. Bramwell at the Institute of Naval Architects last year, is probably one of the worst among all the unprofitable modes of employing steam. The plan adopted by Messrs. Dorsett and Blyth of making the oil do this itself, without using steam, was, therefore, very advantageous, inasmuch as it offered a means of obtaining the full effect the oil was capable of exercising, without any such deduction as was unavoidable when a steam-jet was used

The statements made as to the results obtained in using as liquid fuel the creasote, or dead oil produced from gas tar, vary considerably. Messrs. Wise, Field and Aydon claim to have obtained an evaporative effect equal to 19·5 lbs. of water per lb. of oil. Mr. Alfred Crow declares one ton of oil to be equal to three tons of coal. Mr. Barff claims to have evaporated 22 lbs. of water per lb. of oil; Mr. Thomas Crow 18·91 lbs.; another firm, using his apparatus, represent the oil as being equal to 2·86 times its weight of coal. Mr. Goddard, of Ipswich, takes it as equal to three tons of coal; and Mr. Richardson claims to have evaporated 18·5 lbs. of water per lb. of oil. All these results, however, fall very far short of the efficacy claimed for liquid fuel, which we have already referred to; instead of its being equal to six times its weight of coal, the highest of these results do not make it more than three times as effective as coal. Even the apparent existence of this latter relation is dependent upon the figures given in these estimates being expressive of the actual duty of the fuel, and not the evaportion from water at the boiling point, for with that vagueness and want of precision which characterizes most of the statements as to the results obtained with liquid fuel, there is no information as to which mode of expression the figures given are to be understood as referring to. So far for the positive statements, which, instead of proving an astonishing assertion that one ton of oil is equal to six ton of coal for producing steam, are far from proving that it is equal to even three tons. There are, it is true, certain less positive statements, indicating that the larger results have been, or may be obtained; thus, for instance, Capt. Selwyn, upon whom Mr. Richardson's mantle appears to have fallen, informed the Institute of Naval Architects that in one factory 46 lbs. of water were evaporated by one lb. of creasote. However, for the present at least, and, perhaps, for a long time to come, this must be regarded, like Lord Dundreary's conundrums, as one of the things "no fellow can understand." At the same time we have some other estimates of the capabilities of liquid fuel, and some other results obtained in trials of it, both of which agree in making creasote equal in steam-producing power to one and a half, or twice as much coal, according to the extent to which the efficacy of the latter may be realized in practice. This result has also the advantage of having been conducted with the greatest care and regard to accuracy, not on a mere experimental scale, but in a vessel of five hundred tons, in a passage from Debtford to Gravesend and back. This fact, and the accordance of the result with the calculated capability of the oil, according to its composition, certainly render it more trustworthy than any other results yet put forward, which neither agree with such calculation, nor are supported by any sufficient evidence that the observations on which thay are based are correct.

Nothing can be more prejudicial to the successful introduction of any kind of improvement or novelty than the assertion that it affords advantages which is the most slender knowledge of the subject enables one to perceive are fictions. Such a course is sure to impede rather than facilitate the adoption of suggestions for improvement, or if exaggerated statements be accepted, the result can only be disappointment and disgust. We, therefore, recommend those who are still disposed to urge the adoption of liquid fuel as a substitute for coal in steam navigation, to revise their claims in regard to the efficacy of this material, and to the economy to be gained by its use, so that by establishing their recommendations on a safe and rational basis, they may secure for themselves, though late, a title to consideration which they have not yet possessed.

Magnesium Light.

Late scientific intelligence from England expresses the belief that magnesium, by new processes of manufacture about to be introduced, will be brought down to a shilling an ounce, retail. At this price its use in lamps, in the shape of ribbon of the thickness of heavy paper and a tenth of an inch wide, will be decidedly economical. The magnesium ores and other compounds is unlimited. Dolomite, one of the commonest rocks in the Southern States, and extending in a vast range through New Jersey, New York, Western Massachusetts and Vermont into Canada, contains 45.65 parts of carbonate of magnesia and 54.35 of carbonate of lime.

From the magnesium carbonate the chloride of magnesium is prepared, and from that the metal is eliminated; or the chloride of magnesium can be obtained direct from sea-water, and then reduced to metal by the usual process. It is estimated that a ton of sea-water contains two pounds of the metal. The sources of supply are thus shown to abound all about us; and the only question involved in the use of the metal for illuminating purposes is that of cost, and that question, as we learn, is on the point of being satisfactorily answered.

As our readers may not understand the workings of the magnesium light, we will explain that the metal, in the form of a thin ribbon, weighing but little more, for its bulk, than a delicate wood shaving or a strip of writing paper, is coiled about a drum, and fed by simple clockwork into the flame of a small alcohol lamp. The heat of the flame ignites the metal, and it burns slowly and regularly with the purest imaginable white light equal to seventy-four stearine candles and upwards, according to the size of the ribbon. As it has the essential characteristic (the actinic power) of the solar rays, photographs are easily taken by it. It is, in fact, an imitation of daylight, and therefore specially adapted to the eyes; whereas, the ordinary gas is known to be highly injurious to those organs.

So soon as magnesium can be furnished cheaply enough, Yankee ingenuity may be trusted to invent some still cheaper apparatus for burning it up. It takes but little faith to look with confidence to the introduction of the magnesium light, (unless a better one can be produced,) as a common substitute for other light-giving material, such as tallow, coal oil, etc.

Lighting Streets by Electricity.—A Mr. Wheelér proposes a plan for lighting the streets of New York by electricity. His method is similar to that in operation in the dome of the Capital and the halls of Congress at Washington. He claims that the whole expense of laying wires, erecting the batteries, and lighting the city, will be saved and paid for in a few years, at the present cost of simply lighting the lamps. He estimates that, in twenty years, the saving to the city will be $1,000,000. By the proposed arrangement, if any lamp should be extinguished accidentally, it will immediately relight itself. In addition to the proposed electrical lighting, the wires (he says) can be used for telegraph purposes, and a complete system of telegraphic communication with every part of the city can be arranged. The subject has been referred to a committee of aldermen.

The Proposed Tunnel between England and France.—Mr. H. Beckett, F.G.S., the gentleman appointed to report upon the possibility of effecting a communication between the two countries by a submarine tunnel under the Straits of Dover, presided at a meeting of the Dudley Geogolical Society on Monday evening, and read a paper on the scheme. Mr. Beckett said the promoters of the scheme proposed to drive two parallel tunnels for a single line of rails, and were of opinion that the total cost would be considerably less than 10,000,000*l.* sterling.—*London Builder.*

The Suez Canal.

The Suez Canal may at length be considered almost *un fait accompli.* The waters of the Mediterranean were admitted into the Bitter Lakes, with complete success, on March 18. The Viceroy of Egypt was present, and expressed his satisfaction, and "his thorough confidence" in the speedy completion of the canal. The *Times* was the first to discredit the scheme, and to demonstrate the impossibility of its success, but in its issue of March 20, it is forced to admit that the chief mechanical difficulties of the undertaking have been surmounted; and it adds, "there can be no doubt that in a short time the canal will be open, at least for vessels of a certain tonage, the whole length from Port Said to Suez. Those who hava taken an interest in the canal may remember that in August, 1867, an official statement was made of the condition and prospects of the works. The completion of the canal was fixed for the latter part of the present year, 1869. The canal had attained its full breadth of one hundred meters from the Mediterranean to Lake Timash, and would be at once continued onward to the place called Serapeum and the Bitter Lakes. This part of the promise has been duly fulfilled, and already, in the spring of 1869, the waters of the Mediterranean are flowing into these Lakes, or rather salt marshes, which they will take many weeks to fill. The remainder of the excavation does not present any remarkable difficulty, and we may therefore consider that the work will be completed within a reasonable time and opened to the ships of the world."

The Bitter Lakes are about fifty-nine and a half miles from Port Said, and extend twenty-three and a half miles to the South. From their southern extremity Suez is distant only fourteen miles, and a considerable portion of this distance has already been excavated. Before many months the whole canal, from the Mediterranean to the Red Sea, will have been completed. This is a great triumph for the French engineers, and for M. de Lesseps, whose indomitable energy and perseverance, in the face of difficulties that would have overwhelmed a less confident and able man, have been at length rewarded. It used to be the fashion to laugh at the project as the chimera of French fancy; and English engineers of high position reported that practical difficulties made its success impossible. The harbour would silt up with mud; the banks of the canal, formed in a sandy desert, would cave in; and the result would be disaster to the shareholders, discredit and ruin to its projector. In the end, perseverance and fortitude have prevailed; and now a report by Mr. Fowler in the *Times* declares, that "no apprehension" need be entertained of the channel and harbour being choked by the Nile deposit; and that probably the canal will be kept free without more trouble than is needed to dredge the Thames.

The success of the canal will be likely to inflict great injury upon Alexandria, for a large portion of its present traffic and trade will naturally be diverted to Port Said.—*Morgan's British Trade Journal, April* 1869.

Applying Hydrocarbons for Smelting.

The improvements in the use of hydrocarbonaceous fluids in combination with superheated steam for the purpose of smelting, working of metals, etc., provisionally specified by Mr. Paul Rapsey Hodge, of Adam street, Adelphi, relate to the application and use of hydrocarbons, such as gas tar, petroleum, or paraffin, or any of their combinations, or products arising from them in their manufacture, to be used separately or in combination, and rendered fluid by heat or otherwise, and used in combination with superheated steam through, and by means of, compound jets, wherein the steam and hydrocarbons are brought together at the same time in their proper equivalents to produce proper combustion. If for smelting or melting purposes for any of the metals, he inserts a compound jet in combination with, or in close proximity to, the tuyere holes or blast, or separate apertures may be made especially for these jets, so that the flame and heat arising from the combination and combustion of these two elements may unite and commingle with the other combustibles of the cupola, and reduce the "charge."

He further proposes the use of these compound jets in the smelting, melting, refining, or annealing of iron, brass, copper, lead, tin, silver, gold, or any other metal, either in the cupola, reverberatory, or annealing furnace, or in furnaces wherein the metals are reduced or melted in pots. He uses the compound jets of hydrocarbon and steam in the heating and re-heating of metals for forging, welding, or brazing as in the manufacture of iron or brass tubes, and by distributing these jets at such distances as will emit their flame to produce a uniform heat throughout the whole length of the furnace, such jets to be used either in combination with or without any other fuel. The compound jets are also applicable for the calcination of metalliferous ores, and for other purposes.—*London Artizan,*

Prices of Gas Coals—May 2.

PROVINCIAL.

Duty, $1 25	Coarse. Gold.	Slack. Gold.
Block House	$1 75	$0 75
Gowrie	1 60	0 90
Lingan	1 75	0 75
Sydney	2 13¾	0 71½
Pictou	2 13¾	1 18¾
Little Glace Bay	1 60	0 90
Caledonia	1 60	0 75

AMERICAN.

	Coarse. Currency.	Slack.
Westmoreland Co	$8 90	$8 00
Despard Coal Co	8 50	8 00
Penn	8 90	8 00
Newburgh Orrel Gas	8 50	8 00
West Fairmount Gas Coal		7 00
Powelton Gas Coal	8 00	7 00

Delivered in New York.

PRICES OF FOREIGN COALS—DUTY $1.25 PER TON.

Liverpool Gas Caking	$ 9 50
" " Cannel	14 00
" House Cannel	18 00@19 00
" " Orrel	16 00@18 00

Per ton 2240 lbs., Ex. ship.

PRICES FROM YARD.

Liverpool House Orrel, scr'd	$16@$18
" " Cannel, scr'd	18@$22

Per ton, 2000 lbs. delivered.

Ruling Prices of English and American Gas Coals between 1866 and 1869.

English Caking Coal	$9 to $12
English Cannel	10 to 17

Ex ship.

Despard (American) Coal	$8 to 9¼
Westmoreland	8 to 9¼
Pennsylvania	8 to 9¼
Block House (Cape Breton)	8 to 10
Albert Cannel (New Brunswick)	35

The price of Pictou and Sydney coarse coal is $2.25, with 5 per cent. off to purchasers of 2500 tons. On Pictou coarse coal 10 per cent. off to purchasers of 5000 tons and upward. This discount is intended for the importer's commission, and the price should therefore be quoted $2.35 on both Pictou and Sydney. The price of Sydney fine coal is 75 cents instead of 71¼, without discount. The price of Pictou fine is $1.25. 5 per cent off to large purchasers only, and the quotation should therefore be $1.25.

Recent American Patents.

Pertaining to Gas, Water, Etc.

88,278.—STEAM ENGINE.—Archibald C. Crary. Utica, New York.

88,287.—VAPOR BURNER.—Louis Fischer, Brooklyn, New York.

88,288.—STEAM-GENERATOR.—Addison C. Fletcher, New York City.

88,426.—GAS-PURIFIER.—Peter Munzinger, Phil'a, Pa.

88,341.—TURBINE WATER-WHEEL.—William Henry Snyder, Phelps, N. Y.

88,345.—STEAM-GENERATOR.—Joel Tiffany, Albany, New York.

88,362.—WATER METER.—John A. Bradshaw and Wm. H. Brown, Lowell, Mass.

88,422.—WATER-WHEEL.—James E. Stevenson, New York City.

88,328.—WATER-ELEVATOR.—Chas. F. Woodruff, Newbern, Tenn.

88,495.—STEAM-ENGINE GOVERNOR.—Jeremiah A. Marden, assignor to John H. and Chas. E. Abbott, Boston, Mass.

88,406.—WATER-ELEVATOR.—William M. Palmer, Middlebush, N. J.

88,612.—STEAM PUMP.—William H. Roberts, Mauch Chunk, Pa.

88,520.—GAS-COOLER AND WASHER.—Richard Salter, assignor to himself and Joseph B. Davis, Cincinnati, Ohio.

88,552.—PUMP.—John C. Crawford, Clintonville, Ill.

88,589.—ANTI-FREEZING HYDRANT.—John W. Slocum, Philadelphia, Pa.

88,694.—STEAM-GENERATOR.—Henry J, Brunner, Nazareth, Pa.

Solar Heat as a Source of Power.—M. Mouchot, Professor of Mathematics at the Lyceum of Tours, claims credit for the discovery before M. Ericsson had achieved the development of his ideas on this subject. He states that he constructed receptacles in which the solar heat might accumulate like the water of a running stream at a weir or barrier. For this purpose he took a metallic vessel of suitable form, and, after having blackened the ontside, placed it on some sand, brick, or other imperfectly conducting material. He then covered it with a glass lid and presented it to the sun's rays, projecting into it from behind a considerable increase of heat by means of a metallic mirror. If the metallic reservoir be empty, it is easy to produce therein in less than half an hour the temperature of 200 deg. M. Mouchot, in 1861, thus caused water to boil, and the French Emperor himself, at Biarritz in 1866, made successful experiments with a small steam engine provided with a solar boiler or heating apparatus. The French rival of M. Ericcson asserts that he has at different times cooked meat and vegetables, baked bread, and distilled brandy by his process, and that he can adapt it to steam or hot-air engines. He is about to publish a work on the subject.—*Exchange.*

Preservation of Meat.—According to a recipe patented in England, meat of any kind may be preserved in any temperature after it has been soaked for ten minutes in a solution made of the following ingredients, well mixed: One pint of common salt dissolved in four gallons of clear cold water and half a gallon of the bi. sulphite of calcium solution. It is said that experiments show that meats so prepared will keep for twelve days in a temperature of from 80 to 130 degrees, and preserve their odor and flavor unimpaired. By repeating the process meats may be indefinitely preserved, and if it is desired to keep them an unusually long time, a little solution of gelatine or white of an egg may be added to the wash.

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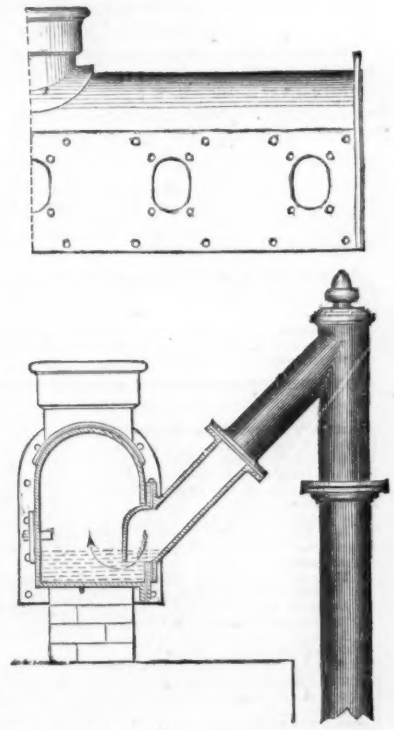

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PROFESSOR HENRY WURTZ.

[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

MONDAY, MAY 3, 1869.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS* or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

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NOTICE.

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TO OUR SUBSCRIBERS AND PATRONS.

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Answers to Correspondents.

M. B., of Mass.—From a given weight of hydrogen gas under combustion a greater quantity of steam can be generated than from an equal weight of any other known combustible. A pound of pure carbon will evaporate 12½ pounds of water, and convert it into steam of 15 pounds pressure on the square inch. One pound of good Pennsylvania anthracite is capable of raising 9½ pounds of water at 312° Fah. into steam.

J. L., of N. Y.—Petroleum is a mixture of various hydrocarbons, and probably no two specimens have the several chemical compounds mixed in the same proportion. In the process of precipitation the more volatile substances are separated, and these are called benzine. As benzine is composed of a number of hydro carbons mixed in various samples in various proportions, there is no fixed boiling point common to all the samples.

FACTS ABOUT GAS FOR THE PEOPLE.

DISPOSITION OF GAS BURNERS.

Much of the economy and effect of gas-light depends upon the arrangement of gas being in relation to each other, and in relation to the surroundings of furniture, hight of ceilings, distance and angles of walls, hangings, etc.

The general practice in this country and in Europe of disposing burners in chandelairs in the center of rooms, although pleasing to the eye in its artistic effect, simply as an ornament to the room, is far from being the most philosophical manner to obtain the best effect from the light.

The diffusion of light, in its effects, are materially modified by the laws of reflection and refraction.

Light decreases in intensity in proportion to the square of the distance from the burner or point of illumination. This is a general rule, but in a room with four white walls and a ceiling, the reflection of the light upon itself, as it were, will apparently modify the rule.

Shadows have much to do in the effective and satisfactory lighting of any hall or room. Hence it is a single light or a centre piece or uncelus of lights as represented by a chandelier is objectionable, because your shadow will appear in any part of the room opposite to the light, and is more or less inconvenient in proportion as it differs in that respect from day light, which is so diffused as to avoid this evil except in peculiar conditions.

Now in view of these suggestions, is it not apparent that the proper and most efficient position for gas burners is at the different sides, or better, the different angles of a room. Then the intensity of light will be more uniform in every part of the room, no shadows will be formed, and the reflective action of the walls will be most effective. These *reflections* will show the folly of using bracket lights at one side only of a room, where shadows fall in every direction it is possible to move from it and with increased intensity as you go, until the gloom of the opposite side brings you back like the moth, to be blinded by the glare of the immediate proximity of a single luminary. If brackets are to be employed, let there be at least two in a room, and these disposed *vis a vis*, or as nearly so as possible.

REFLECTORS.

The value of reflectors are not appreciated as they should be, and the reason is principally because few people, even those whose business is to make apparatus for artificial light and attend to the introduction of gas fixtures, etc., are not sufficiently acquainted with the laws that govern reflected light, or if so, they fail in the mechanical ability to properly arrange reflectors so as to obtain the proper effect. Reflectors should be made of a material that will not tarnish, by the action of the atmosphere or the temperature they may be exposed to. A very slight film of dust, moisture or smoke on a reflector will almost entirely destroy its value as a reflector. The surface of reflectors should be perfectly smooth and free from scratches and abrasions. Hence, it is apparent that metallic reflectors are not the best in that respect.

Glass reflectors are superior inasmuch as they do not become tarnished, abraded, or scratched, but their action is impaired if the glass is too thick, owing to the absorption of light. The late American invention of a Mica reflector is advantageous on that account, because the plates or lamina are very thin. It has also the advantage of not being fragile or liable to fracture.

White porcelain reflectors and metal enameled or porcelainized are valuable in some cases, especially where the reflector is to be near the flame. The nearer to the light a reflector is placed, the less the size of the reflector required to collect and throw off the rays of a given area, and generally it may be accepted, that the nearer the reflector to the flame the more perfect the reflection, other things being equal.

Reflectors are better placed overhead; a reflector which throws the light in a horizontal direction, unless neutralized by another opposite, will be very disagreeable owing to the dazzling glare. As a rule reflectors should be so placed that the reflective rays shall *never reach the eye in a straight line*. This will avoid the evil effects of glare. As a rule, all the *direct rays* of a lamp or burner *thrown upward* may be *thrown downward* by reflectors, producing a great economy of light, and an effectiveness of illumination very pleasant and satisfactory. The ordinary mirrors in a room should be so disposed as to throw off and disperse the light of the different burners. In this manner, the illumination in a room may be increased very materially.

IS WELL WATER PURE?

The poisonous character of the well water of many of our large cities has often been the subject of remark by health committees. Notwithstanding the introduction of wholesome water in almost every town of any size, numbers of the people prefer to use the water pumped from wells, being led to this choice by the false impression that its crystal clearness and coolness is an evidence of its purity, and by the contrast which it bears in this respect to hydrant water. As an evidence of the baneful effects exerted by city well water, the report of Dr. Letheby, made in 1861 to the city commission of Sewers of London, may be cited, in which the most indubitable evidence is given as to the impurities contained in this water, which percolating through soil filled with the filthy accumulations of ages, dissolves many deleterious compounds, which give rise, in numerous instances, to diseases of the most virulent character.

If this be the case in London, it is doubtless true, to a certain extent, that in many cities in America wells of water exist which are daily used by thousands of persons and which are reservoirs of pestilence and death. The shallowness of the greater number of these wells is well known, and their proximity to filthy gutters, sewers, and ceas-pools, sufficiently marked to suggest an idea of the revolting character of the water drawn from them. Although the water in permeating through the soil, loses, to a great extent, the oders with which it at one time was laden, yet its danger is by no means lessened. Presenting a sparkling clearness; it appears to be much purer than the water from the hydrants, and in summer presenting the additional recommendation of coolness, it is preferred to the latter. It should be understood that the clearness of well water makes it by no means an evidence of its purity. On the contrary, the very salts held in solution impart to it its clearness, and many of them are deleterious in their effects on the system. In addition to the organic matter dissolved by well water as it percolates through decaying animal or vegetable remains, though aiding in sustaining its sparkling appearance, conceals beneath it danger of the most serious nature.

A very little reflection should be sufficient to prove the extent of the evil to every thinking mind. Where the nature of the subsoil of a large city is taken into account, the filth which accumulates in its rain-fall can be easily estimated. The gutters—reeking with the most offensive odors—the ceas-pools and crowded grave-yards, are the most fruitful sources of the water which gathers in wells within the city limits, and it will not require a very vivid imagination to depict its quality after permeating such reservoirs of corruption. It is repulsive to contemplate, but nevertheless true.

The abundance of a pure and wholesome water supply is universally acknowledged to be one of the most valuable promotions of the public health. The use of an impure water is no less widely admitted to be the source of complicated diseases which have, in repeated instances, been traced to their proper origin. In view of this fact it is all important that the danger attending the use of city well water be pointed out and steps be taken to guard against the evil arising from it, in which all the inhabitants of crowded communities are interested.

THE GAS BILL.

The bill which emenated from the special committee appointed to investigate the workings of the Gas Companies in New York and Brooklyn has passed the House by a vote of 94 to 16. The bill provides that gas companies shall not charge a rent for meters, that they shall be obliged at all times to keep a full pressure of gas of good quality, that no deposits of money shall be taken from subscribers, and that incoming tenants of houses or apartments shall not be liable for the amount of any gas bill contracted and due by a former occupant. A board to be called "The Board of Gas Examiners," to be made up of three eminent chemists familiar with the manufacture of gas, residing in the cities of New York and Brooklyn to be appointed by the respective Mayors, shall hold office for three years and have power to commission inspectors of gas, who shall report to the Board on every meter connected with gas material, its illuminating power, supply, purity, or otherwise. One thousand cubic feet of gas to be furnished at a cost, inclusive of the United States internal revenue tax, not to exceed three dollars.

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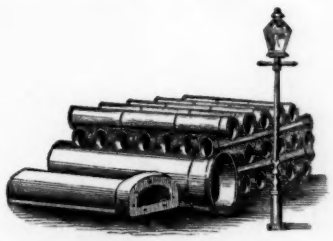

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FIG. 1.

Fig. 1 shows a single gate valve.

Fig. 2 represents wedge and one-half of gate.

Fig. 3, a section through body, gate and wedge, intended for larger sizes of water valves required to bear heavy pressure either side.

The slides, G G, are held against wedge D, by ribs, H H, projecting from sides of valve body, A.

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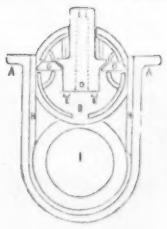

FIG. 3.

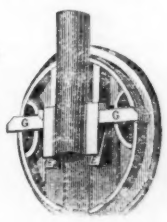

FIG. 2.

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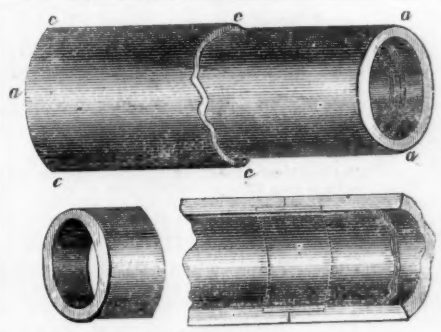

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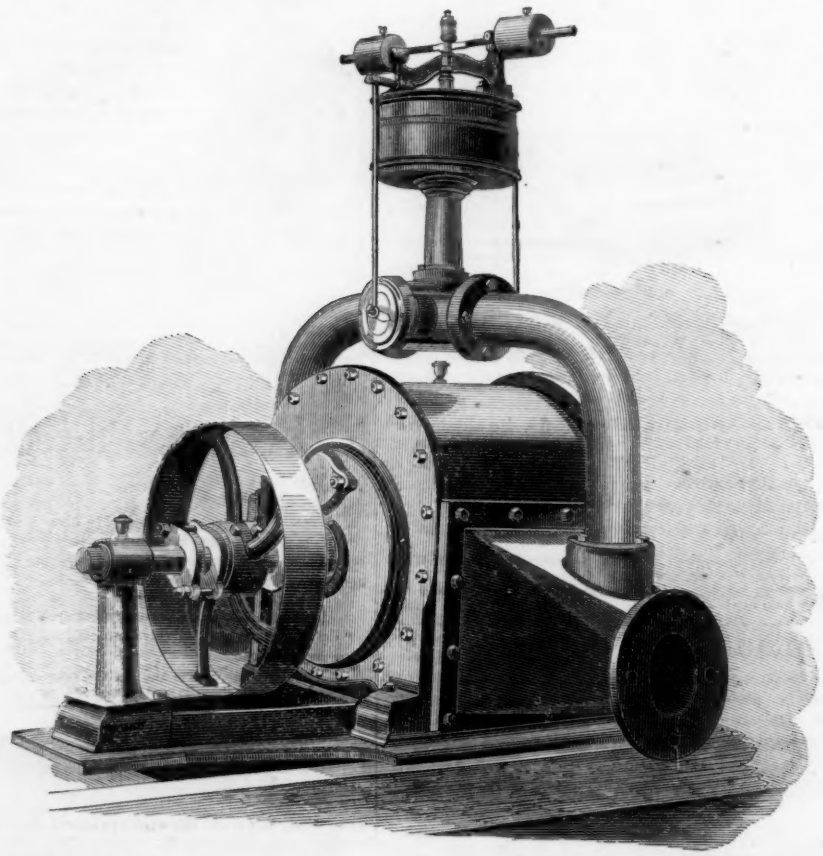

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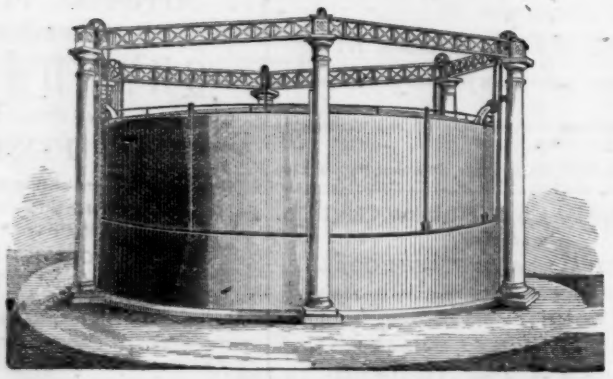

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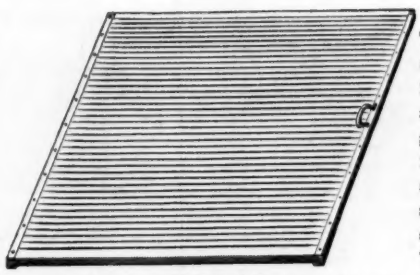

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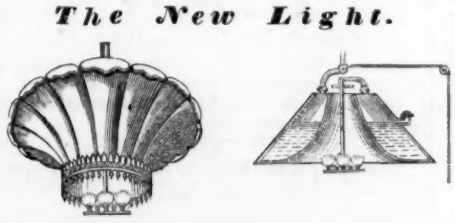

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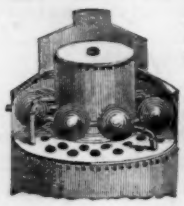

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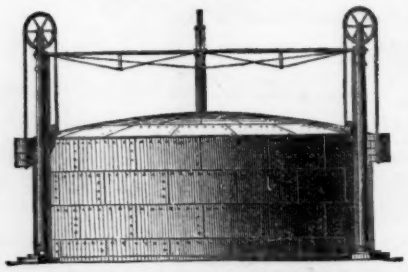

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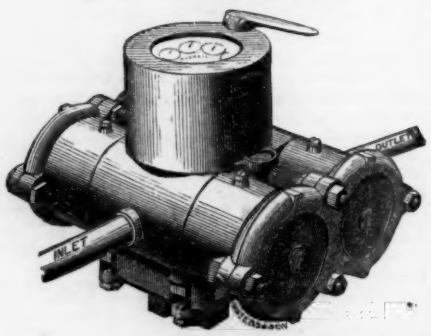

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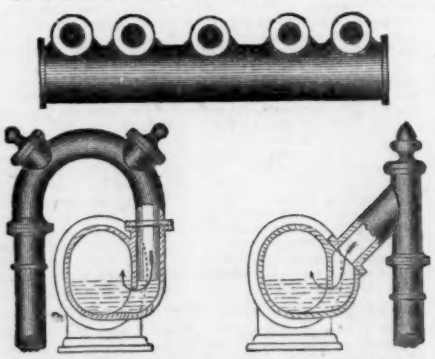

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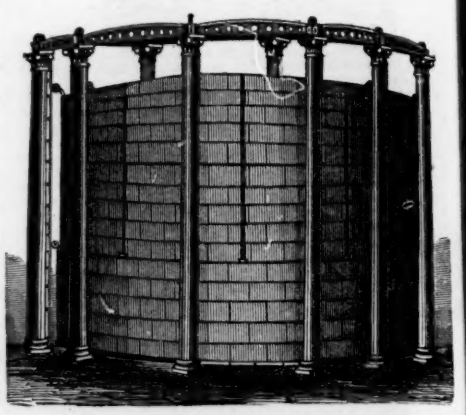

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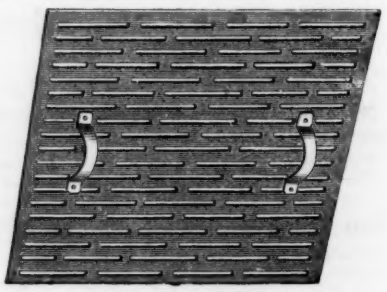

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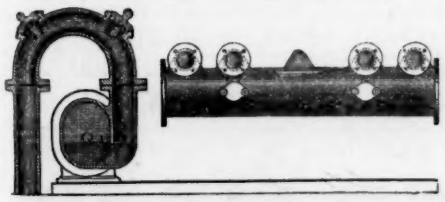

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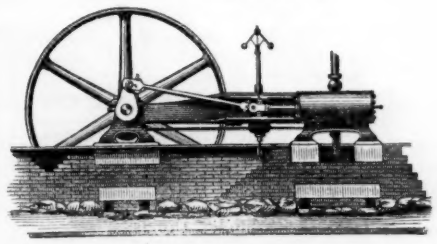

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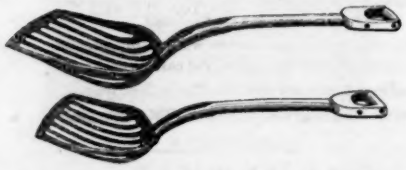

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